



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/508,996	09/27/2004	Alessandro Tredicucci	Q83897	1328

23373 7590 08/27/2007
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

VAN ROY, TOD THOMAS

ART UNIT	PAPER NUMBER
----------	--------------

2828

MAIL DATE	DELIVERY MODE
-----------	---------------

08/27/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/508,996

Applicant(s)

TREDICUCCI ET AL.

Examiner

Tod T. Van Roy

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 28 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 5-13 is/are rejected.
- 7) ☒ Claim(s) 3 and 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/28/2007 has been entered.

Response to Amendment

The examiner acknowledges the amending of claims 1, 3 and 4.

Claim Rejections - 35 USC § 112

The previous 112 rejections are withdrawn.

Response to Arguments

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 5, 7-10, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Colombelli et al. ("Far infrared Surface Plasmon Quantum Cascade

Lasers at 21.5um and 24um Wavelengths"; APL vol.28, no.18, pgs.2620-2622, April 30 2001, applicant submitted prior art).

With respect to claim 1, Colombelli discloses a semiconductor laser comprising: an active region which, in response to a pumping energy (electrical, fig.3) applied thereto, can produce a stimulated emission of radiation with a central wavelength in the far infrared region (pg.2620 col.2 para.1), and at least one confinement region (top metal plasmon layer, pg.2621 col.1 para.1, bottom doped layer, pg.2622 col.2 para.1) for confining the radiation in the active region and comprising at least one interface between adjacent layers that is capable of supporting plasmon modes generated by an interaction of the interface with the radiation (both layer interfaces capable), wherein the at least one confinement region comprises a waveguide layer (n++, pg.2622 col.2 para.1, which replaces n InGaAs layer and location) which is delimited on opposite sides by a first interface (with InP substrate) and by a second interface (with active region), the guide layer being doped in a manner such that the first and second interfaces support the plasmon modes (due to doping, which would make the dielectric constant negative, compared with the positive constants on either side), respectively, and the guide layer being of a thickness such as to bring about the accumulation of the plasmon modes in proximity to the first and second interfaces, outside the layer, and substantially a suppression of the plasmon modes, inside the layer (thickness of 750nm, pg.2622 col.2 para.1, which would accumulate the modes near the interfaces, but only minimally inside the layer, see $\Gamma = 0.98$ for strong active region confinement), wherein the mode intensity of the plasmon modes in proximity to the second interface is

Art Unit: 2828

comparable to the mode intensity of the plasmon modes in proximity to the first interface (it has been shown by Colombelli, and demonstrated by the Applicant – see Remarks pg.2 para.3 – that an amount of the mode intensity is found on the second interface, the 'comparable to' language gives no indication as to the similarity in value of the mode intensity between the two interfaces, only that the values are suitable for comparison; the Examiner suggests changing the claim language to reflect a clearer meaning of the relationship between the mode intensity at each interface).

With respect to claim 2, Colombelli discloses the plasmon modes of the first and second interfaces are mutually coupled (due to thickness, and partial penetration of the mode into the layer, pg.2622 col.2 para.1).

With respect to claim 5, Colombelli discloses the active region comprises a quantum cascade active region (pg.2620 col.2 para.1).

With respect to claim 7, Colombelli discloses the guide layer (recall - is to replace the n InGaAs layer) is interposed between the active region and the substrate region (pg.2621 col.1 para.1).

With respect to claim 8, Colombelli discloses the guide layer is in contact with the active region (pg.2621 col.1 para.1).

With respect to claim 9, Colombelli discloses a first electrical contact region disposed directly on the guide layer (InP substrate, pg.2620 col.2 para.2).

With respect to claim 10, Colombelli discloses a second contact region disposed directly on the active region (n InGaAs / n++ InGaAs, pg.2621 col.1 para.1).

Art Unit: 2828

With respect to claim 12, Colombelli discloses the thickness of the waveguide to be on the order of 100nm (750nm of same order as 100nm, pg.2622 col.2 para.1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colombelli et al.

With respect to claim 11, Colombelli teaches the laser outlined in the rejection to claim 1, and further teaches the use of the device for long wavelength (>50um) emitters (pg.2622 col.2 para.1). Colombelli does not produce a device that emits at between 30-300um. It would have been obvious to one of ordinary skill in the art at the time of the invention to use an emitter having >50um output as Colombelli has taught that the waveguide losses would be reduced for this range (pg.2622 col.2 para.1).

With respect to claim 13 Colombelli teaches the laser outlined in the rejection to claim 1, and further teaches the guide layer to be formed of an n type semiconductor with an n++ "metal-like" doping value (pg.2622 col.2 para.1). Colombelli does not specify the doping value to be on the order of 10^{18} . It would have been obvious to one of ordinary skill in the art at the time of the invention to use a doping on the order of 10^{18} as it has been found to be uninventive to determine the optimum or workable range (see MPEP 2144.05 II A – ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969)).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Colombelli in view of Sirtori et al. ("Quantum cascade laser with plasmon enhanced waveguide operating at 8.4um wavelength"; APL, vol.66, no.24, pgs.3242-3244, 12 June 1995).

With respect to claim 6, Colombelli teaches the laser outlined in the rejection to claim 1, and further teaches the active region to have a non-uniform period (chirp, pg.2620 col.2 para.2). Colombelli does not teach the use of a GaAs/AlGaAs superlattice. Sirtori teaches a plasmon guiding device wherein the use of GaAs/AlGaAs is described (pg.3242 col.1 para.1). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the active region material of Colombelli

Art Unit: 2828

with the taught material of Sirtori in order to adjust the output frequency characteristics as desired.

Allowable Subject Matter

Claims 3 and 4 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 3 specifies a relationship between the real and imaginary portions of the dielectric constants of the waveguide and the materials constituting the two interfaces. It is known in the art that the relationship between the real portions must exist (waveguide negative, surrounding materials positive), but the prior art failed to teach the relationship to extend to the imaginary portions (note: the modulus includes both the real and the imaginary portions).

Conclusion

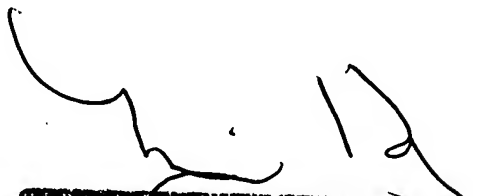
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2828

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TVR


MINSUN OH HARVEY
PRIMARY EXAMINER